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COPY # 35

**Rocky Flats
Environmental Technology Site
95-ENG-WELD-0052
REVISION 1
RMRS WELDING PLAN**

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Construction/D&D

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Responsible Organization: Engineering/Construction/ Effective Date: 5/6/96
D&D

CONCURRENCE BY THE FOLLOWING DISCIPLINES WILL BE DOCUMENTED IN THE PROCEDURE HISTORY FILE:

Engineering/Construction/D&D
Quality Assurance
Subject-Matter Expert

USE CATEGORY 4

The following have been incorporated in this revision:

Reviewed for Classification/UCNI
By C. J. B. Schmitt ^{WBM}
Date 5/7/96

PADC-95-02381

ADMIN RECORD

DOCUMENT CLASSIFICATION
REVIEW WAIVER PER
CLASSIFICATION OFFICE

TABLE OF CONTENTS

	<u>TITLE</u>	1
	<u>TABLE OF CONTENTS</u>	2
1.	<u>SCOPE</u>	3
2.	<u>DESIGN CONTROL</u>	3
3.	<u>MATERIAL CONTROL</u>	4
4.	<u>RMRS WELDING</u>	5
4.1	WELDING PROCEDURES, QUALIFICATION AND RECORDS	5
4.2	WELDING MATERIAL CONTROL	6
4.3	FABRICATIONS OR REPAIRS	7
5.	<u>INSPECTION AND TESTING</u>	8
6.	<u>NONCONFORMING ITEMS</u>	9
7.	<u>SUBCONTRACTORS</u>	9
8.	<u>SAFETY REQUIREMENTS</u>	9
9.	<u>REFERENCES</u>	9

Appendices

Welding Procedure Specification RMRS-T1/1
Welding Procedure Specification RMRS-T8/8
Welding Procedure Specification RMRS-S1/1
Welding Procedure Specification RMRS-D1.1

1. SCOPE

- 1.1 This plan defines the requirements and responsibilities for Rocky Mountain Remediation Services (RMRS) to perform welding at RFETS in accordance with the American Society of Mechanical Engineers (ASME) Code for Pressure Piping, B31 Series; American Welding Society (AWS) Structural Welding Codes, D1.1, D1.2, and D1.3; or other specified codes, standards, or specifications; hereinafter referred to as the Code.
- 1.2 RMRS will not manufacture, alter, or repair ASME Code stamped pressure vessels. All welding on coded vessels will be performed by Kaiser-Hill or approved subcontractors with the required ASME or National Board Stamp.
- 1.3 This plan is applicable and mandatory to each component, part, or subassembly manufactured, altered, or repaired by RMRS.
- 1.4 Procedures and practices not specifically addressed in this plan will be in accordance with RMRS policies and procedures.

2. DESIGN CONTROL

- 2.1 To ensure proper identification, each drawing, calculation sheet, specification, and supporting document prepared for welding components, parts, and appurtenances shall be identified with a specific project title and project number.
- 2.2 Design calculations shall be prepared by the Design Engineer for Code fabrication or repair project as required. Calculations shall comply with the requirements of the applicable sections of the Code and the RFETS Conduct of Engineering Manual (COEM)
- 2.3 The Design Engineer shall specify the Code, RFETS Standard, or other applicable welding requirements on the drawings, construction and procurement specifications, or other design documentation. Industry codes, or RFETS standards and specifications based on industry codes shall be used to the extent possible to specify welding requirements. The applicability of AWS D1.1 shall be based on the definition of structural steel in accordance with the AISC Code of Standard Practice, Section 2.0.
- 2.4 Drawings or sketches shall be prepared by the Design Engineer for all items, parts and appurtenances related to Code fabrication and repair projects per the COEM. If not identified in the design specification; drawings shall include: (1) weld joint design, showing welding symbols; (2) a materials list with materials conforming to the applicable

sections of the Code and specified by the ASTM or other specification required by the Code.

- 2.5 RFETS procedures and standards used for welding, heat treating, nondestructive examination (NDE), inspection, testing, and cleaning shall specify the technical requirements and acceptance criteria for Code fabrication or repair. The Design Engineer is responsible for the inclusion of applicable Code requirements into any procedure used for a Code project.
- 2.6 Design packages for piping fabricated in accordance with RFETS Standard SP-211, "Fabrication of Piping Systems," shall include a Piping Fabrication Traveler.
- 2.7 All design packages for Code fabrication shall be reviewed and distributed in accordance with the COEM.
- 2.8 All design changes including material substitution shall be made in accordance with the COEM.

3. MATERIAL CONTROL

- 3.1 All materials (including welding materials) used for Code projects shall be purchased to the ASME (or identical ASTM or AWS) specifications. Welding material shall comply with RFETS Standard SM-125, "Welding Rod" and the appropriate Welding Procedure Specification (WPS). Piping materials shall comply with RFETS Standard SP-220, "Piping Material Specification".
- 3.2 All Code materials will be procured in accordance with RMRS procurement policies and procedures. The purchase order shall require the supplier to provide identification traceability through specification, heat or lot number, size, AWS or SFA classification, purchase order number, and submittal of material test reports. Bare filler material supplied in cut lengths shall be tagged on both ends with the alloy identification.
- 3.3 Receiving inspection of Code materials will be performed by Receiving Control & Inspection (RC&I). RC&I reviews the material for compliance to the Code material specification for proper identification marking, dimensional compliance, and workmanship. Documentation must reference the purchase order number and, upon acceptance, is signed by RC&I.

- 3.4 Acceptable material is released to the applicable material storage area. One copy of the signed documentation is shipped with the material. The original certifications, traceable through the purchase order number, are filed and maintained by RC&I.
- 3.5 All materials for Code projects shall be stored in a controlled area. All material shall be identified as required by the Code, and the identification shall be transferred to any portion that will later become a separate piece.
- 3.6 The issuance and use of Code material specified by the design package is controlled by the responsible Maintenance organization.
- 3.7 The Maintenance Supervisor shall perform the following:
 - 3.7.1 Verify that materials to be removed from the storage area are identical to those specified by the design documentation.
 - 3.7.2 Transfer material identification to any portion of the material that will later become a separate piece (ie. sectioning of plate).
 - 3.7.3 Deleted
 - 3.7.4 Upon issue, prior to fabrication, the Welding Inspector verifies all material is properly identified and recorded. Material not properly identified shall be rejected.
 - 3.7.5 As part of the fitup and tackweld inspection, the Welding Inspector verifies that the material approved in step 3.7.3 was used for the fabrication/repair and is properly identified.

4. RMRS WELDING

4.1 WELDING PROCEDURES, QUALIFICATION AND RECORDS

- 4.1.1 Welding for Code projects shall conform to the requirements of the specified Code. Welding shall be specified by WPSs, which are qualified by Procedure Qualification Records (PQRs) and performed by welders or welding operators qualified by the Welder's Qualification Records (WQRs).

- 4.1.2 RMRS Engineering is responsible for the preparation of the WPS and conducting the qualification tests for the WPS required by the Code. The RMRS WPSs will be qualified by RMRS PQRs. A subcontractor may supply the weld coupons, machine the test specimens, and perform the mechanical testing. An RMRS welder will weld the coupon with an RMRS representative present. RMRS will prepare the PQR. RMRS Engineering will maintain a master copy of WPSs, revisions to WPSs, and the supporting PQRs.
- 4.1.3 RMRS is responsible for the performance qualifications of welders and welding operators in accordance to RFETS Standard SM-126, "Welder Qualification," and certifying the qualification by the WQR record. RMRS may subcontract the qualification testing and record keeping.
- 4.1.4 RMRS or a subcontractor will maintain WQRs and keep a list of currently qualified welders. The 180-Day Documentation shall be used to document a welder's continuity. If subcontracted, the subcontractor will maintain the qualification records and notify RMRS when requalification of a welder is required.
- 4.1.5 The maintenance foreman will assign welders for Code projects and ensure those welders are qualified for the WPS being used. The Welding Inspector will verify the qualification as specified on the traveler, drawing, specification or IWCP package.
- 4.1.6 RMRS management, the Design Engineer, the designated Welding Inspector, or the Kaiser-Hill management designee responsible for welding oversight, may require welder requalification anytime their ability is questioned.
- 4.1.7 Qualified Code welders are assigned a unique welder identification stamp. These stamps are symbols with a unique number related to each. Each stamp will be traceable to the person it was issued to by employee number. RMRS may subcontract the issue and control of stamps. RMRS or the subcontractor will maintain a log of issued stamps. Stamps shall not be reissued for a period of one year following welder retirement.
- 4.2 WELDING MATERIAL CONTROL
- 4.2.1 Welding filler metal used on Code projects shall be procured and received in the same manner as other Code Material.
- 4.2.2 The Maintenance Supervisor is responsible for removal and control of filler metal used for Code fabrication.

- 4.2.3 Cut lengths of bare welding wire must be stored in the original container with the heat number and manufacturer's marking. If placed in a new container, all of the identification must be transferred to the new container. Only cut lengths identified with the heat number may be returned to the storage area after use.
- 4.2.4 Spools of bare welding wire must have the heat number and manufacturer's markings. This identification must remain intact until the material is depleted. Only spools so identified may be returned to the storage area after use. Spools shall be placed in a box or plastic bag when not in use to protect from dust and dirt.
- 4.2.5 Shielded metal arc electrodes must have the ASME or AWS designation stenciled on the electrode. Low hydrogen electrodes must come from an unopened sealed box, or an oven set at the temperature recommended by the manufacturer or the Code. Electrodes stored in an oven must be identifiable the heat/lot number.
- 4.2.6 Low hydrogen electrodes cannot be used outside the sealed container or oven beyond a 4-hour period. Electrodes exposed beyond this period shall be discarded or used for non-Code work.

4.3 FABRICATIONS OR REPAIRS

- 4.3.1 The Maintenance Supervisor responsible for the Code fabrication or repair shall ensure that welding is performed in accordance with the WPSs assigned. The Supervisor is also responsible, along with the designated Welding Inspector, to ensure the following:
 - (1) Material identification markings are visible, identifiable, and traceable on pressure retaining parts.
 - (2) Edges of plate and pipe are visually examined for any evidence of laminations, cracks, or other discontinuities which would adversely affect weld quality.
 - (3) Beveling, fitup, tack welding and welding are within Code acceptable tolerance.
 - (4) Weld joints are clean and free of scale, rust, oil, paint, or other material that would be detrimental to the weld.
 - (5) Production welds are identified with the welder by stamping or etching when required by the Code.

- 4.3.2 Tack welds are treated as a portion of Code welding and will be performed by qualified welders using a qualified WPS. Tack welds to be left in place shall be visually examined and if found to be defective, removed.
- 4.3.3 Each welder shall stamp or mark all welds made with an identification symbol as required by the applicable Code. The stamp shall be adjacent to the weld. Stamping of tack welds is not required. Repair welds shall be stamped adjacent to the repair. ANSI B31.1 and B31.3 require stamping or marking of each weld by the welder. AWS D1.1, D1.2 and D1.3 do not require stamping or marking by the welder.

5. INSPECTION AND TESTING

- 5.1 All inspection and testing will be performed by a subcontractor approved by RMRS. The Welding Inspector is responsible for performing inspections designated by the design and IWCP packages. Welding Inspectors shall be qualified and certified as required by the Code. All Welding Inspectors shall also be AWS Certified Welding Inspectors (CWIs).
- 5.2 All nondestructive examination (NDE) will be performed by a subcontractor using written procedures that have been approved by an appointed Level III Examiner. Appointment of the Level III Examiner will be by letter from RMRS, and will be acknowledged in writing by the Level III Examiner.
- 5.3 All NDE subcontractor Written Practices, personnel qualifications, and equipment calibrations will be reviewed and approved for Code use by RMRS.
- 5.4 All NDE personnel shall be properly qualified for the method, and shall be certified to a Written Practice meeting the requirements of SNT-TC-1A.
- 5.5 Radiographic and ultrasonic testing reports, including radiographic film shall be evaluated, interpreted and accepted by the Level III Examiner. All NDE reports and film shall be reviewed and accepted by RMRS.
- 5.6 Gages, and testing and measuring equipment used for inspection and testing shall be controlled, calibrated and maintained by the RFETS Metrology Laboratory or a subcontractor. Standards used for calibration shall be traceable to the National Institute for Standards and Testing (NIST) where such standards exist.
- 5.7 The Welding Inspector shall document each weld inspected. The documentation shall be traceable to the individual welds with maps, sketches, or other identification.

6. NONCONFORMING ITEMS

Deviations from Code or design package requirements are defined as nonconforming items. All nonconforming items will be processed in accordance with RFETS procedure 1-A65-ADM-15.01, "Control of Nonconforming Items."

7. SUBCONTRACTORS

- 7.1 RMRS may subcontract any or all welding, inspection, and testing as necessary in support of RMRS's welding activities. All subcontractors shall have an established Welding Program. RMRS shall review the subcontractors program and personnel qualifications including WPSs, PQRs and WQRs to ensure they meet Code requirements. These requirements include having qualified welding procedures, and welders with current qualification to the welding procedures that will be used for the project.
- 7.2 All subcontracted activities shall be performed in accordance with all established engineering, health and safety practices utilized by RMRS.

8. SAFETY REQUIREMENTS

Each IWCP Package requiring welding shall stipulate safety precautions for these welding activities. All RMRS and subcontractor welding shall be performed in accordance with the RFETS Health and Safety Practices (HSP) Manual.

9. REFERENCES

- 9.1 ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.
- 9.2 ASME B31.1, Power Piping.
- 9.3 ASME B31.3, Chemical Plant and Petroleum Refinery Piping.
- 9.4 AWS D1.1, Structural Welding Code Steel.
- 9.5 AWS D1.2, Structural Welding Code Aluminum.
- 9.6 AWS D1.3, Structural Welding Code Sheet Metal.

- 9.7 RFETS Policy 8-64, Welding Program.
- 9.8 RFETS Conduct of Engineering Manual.
- 9.9 RFETS Integrated Work Control Program.
- 9.10 ASME B31.9, Building Services Piping.
- 9.11 AISC, Manual of Steel Construction, Code of Standard Practice for Steel Buildings and Bridges.
- 9.12 RFETS Standard SM-102, Austenitic Stainless Steel Welding.
- 9.13 RFETS Standard SM-105, Carbon Steel Welding.
- 9.14 RFETS Standard SM-125, Welding Rod.
- 9.15 RFETS Standard SM-126, Welder Qualification.
- 9.16 RFETS Standard SP-211, Fabrication of Piping Systems.
- 9.17 RFETS Standard SP-212, Design, Fabrication, Inspection and Testing Glovebox Internal Piping.
- 9.18 RFETS Standard SP-220, Piping Material Specifications.
- 9.19 RFETS Standard SG-603, Lead Shielded Stainless Steel Single and Double Wall Gloveboxes.

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)

(See QW-200.1. Section IX, ASME Boiler and Pressure Vessel Code)

Company Name: ROCKY MOUNTAIN REMEDIATION SERVICES
Welding Procedure Specification No.: RMRS-S1/1
Revision No.: 0
Welding Process(es): SMAW

Date: 9/26/95

Date: N/A

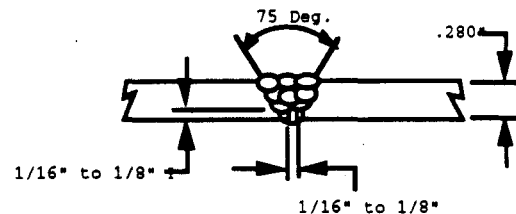
Type(s): Manual

By: *R P Campbell* 4/29/96
Supporting PQR No.(s): RMRS S1/1
RPC 4/29/96

JOINTS QW-402)**Details**

Joint Design: Vee Groove
Backing: Yes ☐ No ☒
Backing Material (Type): None
☐ Metal ☐ Nonfusing
☐ Nonmetallic ☐ Other: None

Sketches, Production Drawings, Weld symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.



(At the option of the Mfr., sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g. for notch toughness procedures, for multiple process procedures, etc.)

*** BASE METALS (QW-403)**

P-No.: 1 Group No.: 1 to P-No.: 1 Group No.: 1

or

Specification type and grade: ASTM A-106, A-36, A-53, A-105 GR. A & B

to Specification type and grade: ASTM A-106, A-36, A-53, A-105 GR A & B

or

Chemical Analysis and Mechanical Property: N/A
to Chemical Analysis and Mechanical Property: N/A

Thickness Range:

Base Metal:	Groove: .054" TO .560"	Fillet: All
Pipe Dia. Range:	Groove: 2 & 7/8" TO UNLIMITED	Fillet: All
Other: N/A		

*** FILLER METALS (QW-404)**

Specification No. (SFA): 5.1

AWS No. (Class): E6010 ROOT, E7018 FILL

F-No.: 6&4

A-No.: A1&A2

Size of Filler Metal: 3/32" & 1/8"

Weld Metal

Thickness Range:

Groove: .054" TO .560"

Fillet: ALL

Electrode- Flux (Class): None

Flux Trade Name: None

Consumable Insert: None

Other: None

* Each base metal-filler metal combination should be recorded individually.

POSITIONS (QW-405)

Position(s) of Groove: 6G
 Welding Progression: Up
 Position(s) of Fillet: N/A

POSTWELD HEAT TREATMENT (QW-407)

Temperature Range: N/A
 Time Range: N/A

PREHEAT (QW-406)

Preheat Temperature - Min.: 60 DEG F
 Interpass Temperature - Max.: 350 Deg. F
 Preheat Maintenance: N/A
 (Continuous or special heating where applicable should be recorded)

GAS (QW-408)

	Percent Composition	
	Gas(es)	(Mixture) Flow Rate
Shielding	None	
Trailing	None	
Backing	None	

ELECTRICAL CHARACTERISTICS (QW-409)

Current: DC Polarity: DCEP

Amps (Range): 90 to 150 (Root) 90-120 (Fill) Volts (Range): 10-16 (Root) 20-25- (Fill)

(Amps and volts range should be recorded for each electrode size, position, and thickness, etc. This information may be listed in a tabular form similar to that shown below.)

Tungsten Electrode Size and Type: N/A.

Mode of Metal Transfer for gmaw: N/A

Electrode Wire feed speed range: N/A

TECHNIQUE (QW-410)

String or Weave Bead: String

Office or Gas Cup Size: N/A

Initial and Interpass Cleaning (Brushing, Grinding, etc.): Wire brushing permitted. Grinding permitted to feather tacks and between fill passes.

Method of Back Gouging: N/A

Oscillation: Manual

Contact Tube to Work Distance: N/A

Multiple or Single Pass (per side): Multiple

Multiple or Single Electrodes: SINGLE

Travel Speed: Manual

Peening: N/A

Other:

		Filler Metal		Current				
Weld Layer(s)	Process	Class	Diameter	Type Polar.	Amp. Range	Volt Range	Travel Speed	Other (e.g., Remarks, comments, Hot Wire Addition, Technique, Torch Angle, Etc.
Root	SMAW	E6010	1/8"	DCEP	90-150	20-26	Manual	Straight Polarity
Fill	SMAW	E7018	3/32"	DCEP	60-120	18-24	Manual	Reverse Polarity

WELDING PROCEDURE SPECIFICATION (WPS) YES ☒
 PREQUALIFIED ☒ QUALIFIED BY TESTING ☐
 or PROCEDURE QUALIFICATION RECORDS (PQR) YES ☒

Identification #: RMRS-D1.1	
Company Name: Rocky Mountain Remediation Services	Revision: 0 Date: 1/8/96 By: <i>RP Campbell</i>
Welding Process(es) SMAW	Authorized By: R. P. Campbell Date: <i>1/11/95</i>
Supporting PQR No. (s) RMRS-D1.1	Type - Manual <input checked="" type="checkbox"/> Semi-Automatic <input type="checkbox"/> Machine <input type="checkbox"/> Automatic <input type="checkbox"/>
JOINT DESIGN USED Type: Single <input checked="" type="checkbox"/> Double Weld <input type="checkbox"/> Backing: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Backing Material: Root Opening: 0" to 1/8" Root Face Dimension: 0" to 1/8" Groove Angle: 60 DEG Radius (J-U): N/A Backgouging: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Method: Grinding (Backgouge root to sound metal before welding second side)	POSITION Position of Groove: 3G & 4G Fillet: ALL INCLUSIVE Vertical Progression: Up <input checked="" type="checkbox"/> Down <input type="checkbox"/>
BASE METALS Material Spec.: ASTM A36 Type or Grade: GR B Thickness: Groove: .375" Fillet: ALL Diameter (Pipe): FILLER METALS AWS Specification: SFA 5.1 AWS Classification: E6010 & E7018	ELECTRICAL CHARACTERISTICS Transfer Mode (GMAW): Short-Circuiting <input type="checkbox"/> Globular <input type="checkbox"/> Spray <input type="checkbox"/> Current: AC <input type="checkbox"/> DCEP <input checked="" type="checkbox"/> DCEN <input type="checkbox"/> Pulsed <input type="checkbox"/> Other: Tungsten Electrode (GTAW): Size: N/A Type: N/A
SHIELDING Flux: N/A Gas: NONE Composition: N/A Flow Rate: N/A Gas Cup Size: N/A Electrode-Flux (Class): N/A	TECHNIQUE Stringer or Weave Bead: STRING Multi-pass or Single Pass (per side) MULTIPLE PASS Number of Electrodes: SINGLE Electrode Spacing: Longitudinal: N/A Lateral: N/A Angle: N/A Contact Tube to Work Distance: N/A Peening: NONE Interpass Cleaning: GRINDING & WIRE BRUSHING
PREHEAT Preheat Temp., Min.: 60 DEG F Preheat Temp., Max. 350 DEG F	POSTWELD HEAT TREATMENT Temp.: NONE Time: N/A

Filler Metals				Current		Joint Design	
Pass or Weld Layers(s)	Process	Class	Diameter	Type & Polarity	Amps or Wire Feed Speed	Volts	Travel Speed
ROOT	SMAW	E6010	1/8"	DCEP	90-130	12-18	manual
FILL	SMAW	E7018	3/32" & 1/8"	DCEP	100-160	15-25	manual

Prequalified Joint as shown in AWS D1.1 - 94, Figure 2.4, Joint Designation BU2